DEPARTMENT OF THE ARMY
Omaha District, Corps of Engineers
106 South 15th Street
Omaha, Nebraska 68102-1618

| | |
|---|---|
| :NOTICE: Failure to acknowledge :<br>:all amendments may cause rejec- :<br>:tion of the offer. See FAR :<br>:52.215-1 of Section 00100 : | Solicitation No. DACA45 03 R 0017<br><br>Date of Issue: 12 JUN 2003<br>**Date of Receiving Proposals: 23 JUL 2003** |

Amendment No. 0001
30 June 2003

SUBJECT: **Amendment No. 0001** to Request for Proposal Solicitation Package Construction of the Wing Headquarters/Administration Facility, Buckley AFB, Colorado. Solicitation: DACA45-03-R-0017

TO: Prospective Offerors and Others Concerned

1. The specifications and drawings for subject project are hereby modified as follows (revise all specification indices, attachment lists, and drawing indices accordingly).

a. Specifications. (Descriptive Changes.)

**1. Section 05500A, Page7:** After Para. 2.11, add new paragraph as follows:

**"2.12 FLAGPOLES**

Provide flagpoles and base constructed to withstand not less than 90 MPH wind with recommended flag flying. Flag sizes will be 5 ft. x 8 ft. and Government furnished. Coordinate setting of base with other affected subcontractors.

The tubing for the flagpoles will be seamless aluminum tubing, alloy 6063-T6. Provide minimum wall thickness over entire pole length of 0.156 inches. Butt diameter will be a maximum of 7 inches and the top diameter will be a maximum of 4 inches. Pole will have a uniform conical taper from top to bottom. Poles will have a satin ground anodized finish.

Provide minimum 5-inch ball with No. 14 gauge clear anodized aluminum finish with flush seam. Provide truck that has stainless steel ball bearings, non-fouling, revolving, and double truck assembly. Provide two 9-inch cast aluminum cleats with stainless steel fasteners. Provide two continuous halyards, each with braided nylon and steel core, minimum 5/16inch diameter, and two chrome plated bronze swivel snaphooks. Provide flash collar with finish to match pole.

Provide sufficient hardware for plumbing pole after erection. Provide positive lightning ground for flagpole installation."

2. **Section 13851A, Page 9:** delete contents of Para. 1.4.3.a and substitute: "Transmission of signals over the station radio fire reporting system. The signals shall provide RS-422/485 serial interface between FACP and MUXPAD II-RF Polling Radio as manufactured by DIGITIZE."

3. **Section 13851A, Page 16:** Delete the title of Para. 2.8 and substitute the following new title and contents:

"2.8 Transceiver

Notwithstanding Section 00700 Contract Clauses FAR 52.236-5, Material and Workmanship, the fire alarm transceiver shall be MUXPAD II-RF as manufactured by Digitize in order that fire alarm reporting is compatible with the Base Fire Alarm Station. No other product will be acceptable. The Competition Advocate authorizes sole source procurement."

4. **Section 16415A, Page 19:** Para. 2.2, line 2, delete "4 inch" and substitute "6 inch".

5. **Section 16415A, Page 36:** add the following at the end of Para. 2.23: "All transformers shall have copper windings only."

b. Specifications (New and/or Revised and Reissued). Delete and substitute or add specification pages as noted below. The substituted pages are revised and reissued with this amendment.

| Pages Deleted | Pages Added or Substituted |
|---|---|
| CO020002, Pages 1-4 | CO030002, Pages 1-5 |
| CO020012, Pages 1-6 | CO030012, Pages 1-7 |
| | Attachment to Section 00800, Soil and Foundation Investigation |

c. Drawings (Not Reissued). The following drawing sheets of drawing code AF610-12-04 are revised as indicated below with latest revision date of 30 June 2003. These drawings are not reissued with this amendment.

1. **Sheet C8.04:** Delete flagpole detail heading/text.

2. **Sheet CR.01:**, add an new general note to the drawing sheet as follows:

"GENERAL NOTE: See Specification Section 13285 for Skeet Range Custodial Action, which must be accomplished prior to initiation of other site work."

3. **Sheet A4.23:** Revise drawing sheet by adding attached sketch SKA-1 (Wall Paneling Detail).

4. **Sheet F5.00:** KEYNOTES, delete contents of Key Note 17 and substitute the following: "Radio Communication to existing Base Fire Department over the station radio fire reporting

system by Digitize MUXPAD II-RF polling radio. Interface to FACP via RS-422/485 serial connection."

**5. Sheet EU.00:** add the following to KEYNOTE No. 6:

"See Sheet D1.01 for the location referenced. The approximate length of existing ductbank between the Wing HQ and the referenced manhole is approximately 5,000 feet, and manholes are located approximately 500 feet apart on this run. Manholes generally have no water in them. A confined space entry permit will be required for entrance into these manholes."

d. Drawings (Reissued). The following drawing sheets of drawing code AF610-12-04 are revised with the date indicated on the drawings and reissued with this amendment.

**1. Sheet D2.00** DRAWING INDEX
**2. Sheet A6.03** ARCHITECTURAL DOOR AND SIGNAGE DETAILS

2. This amendment is a part of the proposing papers and its receipt shall be acknowledged on the Standard Form 1442. All other conditions and requirements of the request for proposal remain unchanged. If the proposals have been mailed prior to receiving this amendment, you will notify the office where proposals are received, in the specified manner, immediately of its receipt and of any changes in your proposal occasioned thereby.

a. Hand-Carried Proposals shall be delivered to the U.S. Army Corps of Engineers, Omaha District, Contracting Division (Room 301), 106 South 15th Street, Omaha, Nebraska 68102-1618.

b. Mailed Proposals shall be addressed as noted in Item 8 on Page 00010-1 of Standard Form 1442.

3. Offers will be received until 2:00 p.m., local time at place of receiving proposals, 23 JUL 2003.

Attachments:
Spec Pages listed in 1.b. above
Sketch listed in 1.c above
Drawings in 1.d. above (posted to the Website for downloading)

U.S. Army Engineer District, Omaha
Corps of Engineers
106 South 15th Street
Omaha, Nebraska 68102-1618

30 June 2003
mrp/4413

GENERAL DECISION CO030002 06/13/03 CO2
General Decision Number CO030002

Superseded General Decision No. CO020002

State: Colorado

Construction Type:
BUILDING

County(ies):
ARAPAHOE

BUILDING CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories)

| Modification Number | Publication Date |
|---|---|
| 0 | 06/13/2003 |

COUNTY(ies):
ARAPAHOE

ASBE0028A 01/01/2003

| | Rates | Fringes |
|---|---|---|
| ASBESTOS WORKERS/INSULATORS (Includes application of all insulating materials, protective coverings, coatings and finishings to all types of mechanical systems) | 18.57 | 5.95 |

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BRCO0007A 01/01/2002

| | Rates | Fringes |
|---|---|---|
| BRICKLAYERS | 21.27 | 6.60 |

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CARP9901E 05/01/2003

| | Rates | Fringes |
|---|---|---|
| CARPENTERS: Acoustical, Drywall Hanging/ Framing and Metal Stud | 22.10 | 6.20 |

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ELEC0068D 06/01/2002

| | Rates | Fringes |
|---|---|---|
| ELECTRICIANS (Including Low Voltage Wiring and Installation of Fire Alarms, Communications Systems and Temperature Controls) | 26.91 | 8.64 |

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ELEV0025B 01/01/2003

| | Rates | Fringes |
|---|---|---|
| ELEVATOR CONSTRUCTORS | 26.935 | 9.355+a |

FOOTNOTE:
a. Employer contributes 8% of basic hourly rate for over 5 years' service and 6% basic hourly rate for 6 months' to 5 years' service as Vacation Pay Credit.

SEVEN PAID HOLIDAYS: New Year's Day; Memorial Day; Independence Day; Labor Day; Thanksgiving Day; Friday after Thanksgiving Day; and Christmas Day.

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IRON0024E 08/01/2002

| | Rates | Fringes |
|---|---|---|
| IRONWORKERS, Structural and Reinforcing | 22.00 | 5.75 |

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| LABO0720B 05/01/2003 | Rates | Fringes |
|---|---|---|
| LABORERS: | | |
| Common and | | |
| Concrete/Mason Tenders | 14.20 | 4.55 |

| PAIN0079N 08/01/2002 | Rates | Fringes |
|---|---|---|
| PAINTERS | | |
| Brush and Roller | 16.39 | 5.04 |
| Spray | 17.39 | 5.04 |
| Drywall finisher/Taper: | | |
| Hand | 17.09 | 5.04 |
| Tool | 17.44 | 5.04 |
| Paperhanger | 17.09 | 5.04 |

| PAIN0930A 07/01/2002 | Rates | Fringes |
|---|---|---|
| GLAZIERS | 25.00 | 5.55 |

| PLAS0577C 05/01/2003 | Rates | Fringes |
|---|---|---|
| CEMENT MASONS/ | | |
| CONCRETE FINISHERS | 22.80 | 5.65 |

| PLUM0003L 07/01/2002 | Rates | Fringes |
|---|---|---|
| PLUMBERS | | |
| (Including HVAC work) | 26.52 | 6.64 |

| PLUM0208N 07/01/2002 | Rates | Fringes |
|---|---|---|
| PIPEFITTERS | | |
| (Excluding HVAC work) | 26.62 | 6.54 |

| SHEE0009A 07/01/2002 | Rates | Fringes |
|---|---|---|
| SHEET METAL WORKERS | | |
| (Includes HVAC duct and | | |
| installation of HVAC systems) | 24.94 | 9.65 |

| SUCO1025A 12/20/2001 | Rates | Fringes |
|---|---|---|
| CARPENTERS | | |
| Formbuilding/Formsetting | 15.79 | .82 |
| All Other Work | 17.87 | 3.55 |

LABORERS

| | | |
|---|---|---|
| Brick Finisher/Tender | 12.98 | 1.71 |

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(ii)).

In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator

(See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

GENERAL DECISION CO030012 06/13/03 CO12
General Decision Number CO030012

Superseded General Decision No. CO020012

State: Colorado

Construction Type:
HEAVY

County(ies):

| | | |
|---|---|---|
| ADAMS | DOUGLAS | MESA |
| ARAPAHOE | EL PASO | PUEBLO |
| BOULDER | JEFFERSON | WELD |
| DENVER | LARIMER | |

HEAVY CONSTRUCTION PROJECTS

| Modification Number | Publication Date |
|---|---|
| 0 | 06/13/2003 |

COUNTY(ies):

| | | |
|---|---|---|
| ADAMS | DOUGLAS | MESA |
| ARAPAHOE | EL PASO | PUEBLO |
| BOULDER | JEFFERSON | WELD |
| DENVER | LARIMER | |

ASBE0028A 01/01/2003

| | Rates | Fringes |
|---|---|---|
| ASBESTOS WORKERS/INSULATORS (Includes application of all insulating materials, protective coverings, coatings and finishings to all types of mechanical systems) | 18.57 | 5.95 |

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BRCO0007F 01/01/2002

| | Rates | Fringes |
|---|---|---|
| ADAMS, ARAPAHOE, BOULDER, DENVER, DOUGLAS, AND JEFFERSON COUNTIES | | |
| BRICKLAYERS | 21.27 | 6.60 |

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BRCO0007G 05/01/2002

| | Rates | Fringes |
|---|---|---|
| EL PASO AND PUEBLO COUNTIES | | |
| BRICKLAYERS | 21.27 | 6.60 |

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CARP2834A 05/01/2003

| | Rates | Fringes |
|---|---|---|
| MILLWRIGHTS | 24.49 | 6.66 |

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ELEC0012D 09/01/2002

| | Rates | Fringes |
|---|---|---|
| PUEBLO COUNTY | | |
| ELECTRICIANS: | | |
| Electrical work where the total cost is $200,000 or less | 18.98 | 7.94 |
| Electrical work where the total cost is over $200,000 | 23.74 | 7.94 |

---

ELEC0068A 06/01/2002

| | Rates | Fringes |
|---|---|---|
| ADAMS, ARAPAHOE, BOULDER, DENVER, DOUGLAS, JEFFERSON, LARIMER, AND WELD COUNTIES | | |

| | | |
|---|---|---|
| ELECTRICIANS | 26.91 | 8.64 |

ELEC0111A 09/01/2002

| | Rates | Fringes |
|---|---|---|
| LINE CONSTRUCTION: | | |
| Lineman | 27.36 | 20.75%+2.30 |
| Groundman | 14.05 | 20.75%+2.30 |

ELEC0113C 01/01/2003

| | Rates | Fringes |
|---|---|---|
| EL PASO COUNTY | | |
| ELECTRICIANS | 24.10 | 3%+10.59 |

ELEC0969B 06/01/2000

| | Rates | Fringes |
|---|---|---|
| MESA COUNTY | | |
| ELECTRICIANS | 20.35 | 4%+5.14 |

ENGI0009A 05/01/2003

| | Rates | Fringes |
|---|---|---|
| POWER EQUIPMENT OPERATORS: | | |
| Blade: | | |
| Rough | 20.62 | 5.77 |
| Finish | 20.92 | 5.77 |
| Bulldozer | 20.62 | 5.77 |
| Cranes: | | |
| 50 tons and under | 20.77 | 5.77 |
| 51 to 90 tons | 20.92 | 5.77 |
| 91 to 140 tons | 21.07 | 5.77 |
| 141 tons and over | 21.83 | 5.77 |
| Forklift | 20.27 | 5.77 |
| Mechanic | 20.77 | 5.77 |
| Oiler | 19.92 | 5.77 |
| Roller: | | |
| Self-propelled, rubber tires under 5 tons | 20.27 | 5.77 |
| Self-propelled, all types over 5 tons | 20.62 | 5.77 |
| Scraper: | | |
| Single bowl under 40 cubic yards | 20.77 | 5.77 |
| Single bowl, including pups 40 cubic yards and over and tandem bowls | 20.92 | 5.77 |
| Trackhoe | 20.77 | 5.77 |

IRON0024F 08/01/2002

| | Rates | Fringes |
|---|---|---|
| IRONWORKERS: | | |
| Structural | 22.00 | 7.61 |

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LABO0086A 05/01/2003

| | Rates | Fringes |
|---|---|---|
| LABORERS: | | |
| Pipelayer | 16.29 | 4.25 |

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PLUM0003E 07/01/2002

| | Rates | Fringes |
|---|---|---|
| ADAMS, ARAPAHOE, BOULDER, DENVER, DOUGLAS (Northern half), JEFFERSON, LARIMER AND WELD COUNTIES | | |
| PLUMBERS | 26.52 | 6.64 |

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PLUM0020B 07/01/2002

| | Rates | Fringes |
|---|---|---|
| PUEBLO COUNTY | | |
| PLUMBERS & PIPEFITTERS: | | |
| Free Zone - 0 to 40 miles | 19.85 | 6.81 |

Zone 1 - 40 miles and over: $19.85 per hour + $32.00 per day per diem will be paid on projects over 40 miles (Zone 1) measured in practical driving miles by the shortest route, beginning at 5th and Main Streets in Pueblo, Colorado, when the employee stays overnight or drives their own vehicle.

Hazardous pay: Add $2.20 per hour to base rate.
Hazardous pay applies to projects at chemical plants, steel mills, cement plants, power generator plants, process piping at manufacturing plants, food processing plants, and all projects which may present a health hazard or serious personal injury.

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PLUM0058B 07/01/2002

| | Rates | Fringes |
|---|---|---|
| EL PASO AND DOUGLAS (Southern half) COUNTIES | | |
| PLUMBERS & PIPEFITTERS | 24.95 | 7.40 |

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PLUM0145B 05/01/2002

| | Rates | Fringes |
|---|---|---|
| MESA COUNTY | | |

| | | |
|---|---|---|
| PLUMBERS & PIPEFITTERS | 21.28 | 6.45 |

PLUM0208J 07/01/2002

| | Rates | Fringes |
|---|---|---|
| ADAMS, ARAPAHOE, BOULDER, DENVER, DOUGLAS (Northern half), LARIMER AND WELD COUNTIES | | |
| PIPEFITTERS | 26.62 | 6.54 |

SHEE0009B 07/01/2002

| | Rates | Fringes |
|---|---|---|
| SHEET METAL WORKERS | 24.94 | 9.65 |

SUCO1033A 12/20/2001

| | Rates | Fringes |
|---|---|---|
| BOILERMAKERS | 17.60 | |
| CEMENT MASONS/CONCRETE FINISHERS | 17.31 | 2.85 |
| CARPENTERS: | | |
| Form Building and Setting | 16.97 | 2.74 |
| All Other Work | 15.14 | 3.37 |
| IRONWORKERS, Reinforcing | 18.83 | 3.90 |
| LABORERS: | | |
| Common | 11.22 | 2.92 |
| Landscape | 12.56 | 3.21 |
| Flagger | 8.91 | 3.80 |
| PAINTERS: | | |
| Brush, Roller & Spray | 15.81 | 3.26 |
| POWER EQUIPMENT OPERATORS: | | |
| Backhoe | 16.36 | 2.48 |
| Front End Loader | 17.24 | 3.23 |
| Skid Loader | 15.37 | 4.41 |

TEAM0435A 05/01/2000

| | Rates | Fringes |
|---|---|---|
| TRUCK DRIVERS: | | |
| Pickup | 14.21 | 5.27 |
| Tandem/Semi and Water | 14.93 | 5.27 |

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(ii)).

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WAGE DETERMINATION APPEALS PROCESS

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* a survey underlying a wage determination
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* a conformance (additional classification and rate) ruling

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Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N. W.
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U.S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

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interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

CTC-GEOTEK, INC.
ENGINEERING TESTING INSPECTION

# SOIL AND FOUNDATION INVESTIGATION

Wing Headquarter/Administration facility
Southwest Corner of Aspen Street
and A-basin Avenue
Buckley Air National Guard Base
Aurora, Colorado

PREPARED FOR:

HDR Engineering
8404 Indian Hills Drive
Omaha, Nebraska 68114-4049

Attention: Mr. Tom Fume

Project 222056 July 12, 2002

155 SOUTH NAVAJO - DENVER COLORADO 80223 303 698 1050 (FAX) 303 698 1053

# TABLE OF CONTENTS


| | |
|---|---|
| Summary | Page 1 |
| Scope of Study | Page 1 |
| Proposed Construction | Page 2 |
| Field Investigation | Page 2 |
| Laboratory Testing | Page 2 |
| Subsurface Conditions | Page 3 |
| Foundations | Page 3 |
| Floor Slab Construction | Page 5 |
| Perimeter Drainage System | Page 8 |
| Lateral Earth Pressures | Page 8 |
| Earth Work | Page 10 |
| Design and Construction Details | Page 11 |
| Concrete | Page 12 |
| Pavement Recommendations | Page 12 |
| Miscellaneous | Page 15 |
| Approximate Boring Location Plan | Plate 1 |
| Logs of Exploratory Borings | Plates 2 thru 4 |
| Legend and Notes | Plate 5 |
| Swell-Consolidation Test Results | Plates 6 thru 9 |
| Summary of Laboratory Test Results | Table 1 |

## SUMMARY

(1) The subsurface conditions encountered at the site were variable and generally consisted of more than 20 feet of silty clay with some sand overlying silty, clayey sand underlain by claystone bedrock to the maximum depth investigated, 45 feet below the existing grade. Groundwater was encountered in the exploratory borings ranging from 31 to 34 feet below the existing grade.

(2) Due to the presence of highly expansive soils, a straight shaft pier (caissons) foundation system is recommended. The piers should be drilled at least 8 feet into non-weathered bedrock. The piers should also have a minimum shaft length of 25 feet.

(3) Floor slab construction recommendations are presented in the text of this report.

(4) A representative from our office should observe the construction operations discussed in this report.

## SCOPE OF STUDY

This report presents the results of a soil and foundation investigation for the proposed Wing Headquarter/Administration Facility to be located near southwest corner of Aspen Street and A-basin Avenue within the Buckley Air National Guard Base in Aurora, Colorado.

The purpose of this study was to explore the subsurface conditions, obtain some data of the pertinent engineering characteristics of the underlying strata, recommend the most appropriate foundation system, attempt to evaluate the risks of slab-on-grade construction, provide pavement recommendations, and address other geotechnical factors in the proposed development.

It should be understood that economic and practical constraints limit our sampling and laboratory testing to only a minuscule fraction of the total mass of soil and/or bedrock which lies within the zone of influence of the proposed structure.

Our analyses, conclusions and recommendations are based upon the assumption that the samples of subsurface strata, which we observed and tested, are representative of the entire soil mass.

## PROPOSED CONSTRUCTION

We anticipate the proposed construction on the site is to consist of a two-story building with partial basement. Parking areas and driveways will be provided at the north and south sides of the building. The design loads are not known at the time of this report but are anticipated to be light to moderate. The finished floor slab elevation is anticipated to be close to the existing grade.

## FIELD INVESTIGATION

Eleven (11) exploratory test borings were drilled on the site at the approximate locations shown on Plate 1. The borings were drilled with 4-inch diameter, continuous flight, solid-stem power auger using a truck-mounted drill rig.

At regular intervals the drilling tools were removed from the boreholes and soil samples were obtained with a 2 inch I.D. California Spoon Sampler. The sampler was driven into the various subsoil strata with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler one foot, or a fraction thereof, constitutes the penetration test. This field test is similar to the standard penetration test described by ASTM Method D-1586. Penetration resistance values, when properly evaluated, are an index to the soil strength and density. The depths at which the samples were taken and the penetration resistance values from the borings are shown on the Logs of Exploratory Borings, Plates 2 through 4.

## LABORATORY TESTING

All samples were inspected and classified in the laboratory by the project engineer. Natural water contents, dry unit weights, Atterberg Limits and partial gradations were obtained from relatively undisturbed drive samples obtained at the site (see Table 1).

Swell-consolidation tests were performed on typical specimens of potentially swelling materials (see Plates 6 through 8). These tests indicate the behavior of these materials upon loading and wetting.

## SUBSURFACE CONDITIONS

The subsurface conditions encountered at the site were variable and generally consisted of more than 20 feet of silty clay with some sand overlying silty, clayey sand underlain by claystone bedrock to the maximum depth investigated, 45 feet below the existing grade.

The on-site silty clay with some sand was typically brown to light brown, slightly moist to moist. As indicated by the penetration resistance values, the silty clay with some sand was firm to stiff. As presented on the swell-consolidation test results(Plates 6 through 8), the on-site silty clay with some sand possessed a low to high expansive potential upon wetting.

The on-site silty, clayey sand encountered was typically light brown to brown, moist to wet, and medium dense to dense.

The claystone bedrock encountered was typically grey to yellowish grey to brown, and moist to very moist. As indicated by penetration resistance values, the claystone bedrock was generally stiff to hard.

Groundwater was encountered in the exploratory borings ranging from 31 to 34 feet below the existing grade. It should be noted that groundwater levels can vary and perched water tables can be created with changes in precipitation, irrigation, drainage and land use.

## FOUNDATIONS

Due to presence of highly expansive soils, we recommend that the proposed building structure be founded on straight shaft drilled piers (caissons). Using the drilled pier type of foundation, each column is supported on a single drilled pier or building walls are supported on a grade beam founded on a series of drilled piers. Load applied to a pier of this type is transmitted to the bedrock, partially through peripheral shear stresses which develop on the sides of the pier and partially through end bearing pressure.

Design values for drilled piers are based on the field and laboratory test results and the supporting capacity of the average of the softest materials encountered. The strength of the bedrock increases with depth. For the portion of the pier in **non-weathered bedrock**, we recommend the following maximum allowable end bearing and compressive side shear values. Estimated pier settlements at the site are less than 1 inch.

| Penetration Into **Non-Weathered Bedrock** (feet) | Maximum Allowable End Bearing Pressure (psf) | Compressive Side Shear (psf) |
|---|---|---|
| 0 – 8 | --------- | 2,000 |
| 8+ | 25,000 | 2,000 |

A minimum dead-load of 20,000 psf times the piers cross sectional area should be utilized. If the minimum dead-load criteria can not be met, additional bedrock penetration utilizing the tension shear should be used along with additional steel reinforcing.

A design value of 60 percent of the compressive side shear may be used for the tension shear.

Drilled piers should penetrate at least 8 feet into non-weathered bedrock and should have a minimum shaft length of 25 feet.

A minimum pier size of 16 inches or 5 percent of the expected total shaft length, whichever is greater, should be used. To achieve full design pressures, piers should be spaced at least two diameters, edge-to-edge apart. If closer piers must be used, design pressures will need to be adjusted. The allowable design pressures would be a linear relationship from 100 percent at two diameters apart down to 75 (end bearing) and 67 (side shear) percent at no diameters apart, that is with edges touching. If two nearby piers are of different diameters, the spacing ratio should be determined based on the smaller diameter of the two.

Claystone bedrock was encountered in three(3) exploratory borings out of the eight(8) borings drilled in the proposed building area. The bedrock depth was approximately 35 to 38 feet below the existing grade. However, the variation of the bedrock depth must be anticipated at the subject site. If soft lenses and pockets of claystone bedrock were encountered at the design penetration, additional pier penetration is required to pass the soft zone. A representative from CTC-Geotek, Inc. must inspect the pier installation and verify the bedrock conditions.

For uniform building code seismic analysis (UBC 1997) the site can be considered to be in Seismic Zone 1 and Soil Profile Type $S_C$. The soils at the site are not particularly prone to liquefaction. Site conditions do not require the use of structural ties between individual foundation elements.

Lateral pier design parameters would be horizontal modulus of subgrade reaction values of 50 tcf and 200 tcf for the overburden materials and the bedrocks, respectively. The modulus values are based on a pier diameter of 1 foot. Values used should be the preceding divided by the actual pier diameter in feet.

## FLOOR SLAB CONSTRUCTION

**Due to presence of highly expansive soils, floor slabs should ideally be structurally supported.** This is the safest way to construct slabs where expansive materials are present. In this case, the floor slabs could be supported on void form, and grade beams and piers, the same as the structure. A 12 inch minimum "void" or crawl space would be placed beneath the floor system. This would greatly reduce the risk of damage to slabs and interior partitions due to swelling soils.

Adequate precautions should be taken during construction to minimize excessive wetting of the subgrade soils and/or excessive drying of the fill material in the building pad. Adequate drainage for runoff and timely backfill of excavations in the building pad is recommended.

Provided the owner can accept some risk of slab movement, slab-on-grade construction is possible. If this alternate is chosen, it is recommended that the following measures be taken to help minimize, but not eliminate, the floor slab movements:

A) The on-site soils should be excavated to a depth of at least 6 feet below the bottom of floor slabs including basement floor slabs.

B) Floor slabs should be placed on at least 6 feet of non-swelling select fill, including at least 12 inches of imported, inherently non-swelling relatively impervious soils (sand cap), such as silty sand or "crusher reject" at the top. The select fill should extend laterally to at least 6 feet outside the proposed foundation wall location. The select fill should be compacted to at least 95 percent of the maximum Standard Proctor density (per ASTM D-698) at a moisture content sufficient to minimize swell potentials.

C) The select fill should consist of either inherently non-swelling material, such as sands, or at increased risk, materials which can be placed and maintained in such manner that its swell potential is minimized. Any on-site or imported material should be approved by a geotechnical engineer prior to use as select fill. The on-site silty clay with some sand, exclusive of topsoil and organic matters, is anticipated to potentially be the latter type. We recommend further laboratory testing be performed prior to reuse of the on-site silty clay.

The on-site claystone bedrock including weathered claystone material should not be used as select fill. The quantity of the on-site soils that are available to be used as select fill is not known at the time of this report. Import of select fill may be required. The Earth Work section of this report provides additional select fill selection and placement criteria.

D) Separate slabs from bearing members to allow their independent movement. Joints (construction joints/saw cuts) in the slabs at maximum spacings in accordance with ACI requirements.

E) Place a minimum 3 inch "void" above, or preferably below non-bearing partitions in slab-on-grade areas. Door jambs, drywall, heating and cooling equipment, etc., should be similarly protected.

F) **Keep any exposed clay subgrade moist during construction by occasional sprinkling.**

G) No irrigation should occur for a distance of 6 feet beyond the building limits. Those areas may be covered with decorative gravel or artificial lawn, or preferably pavement. All exterior joints (building-sidewalk, curb pavement, etc.) should be well sealed. Roof downspouts should discharge on splashblocks, downspout extensions, or pavements to beyond the limits of the foundation backfill but not less than 6 feet from the building. Lawn watering should be minimized in the remainder of the site.

H) A polyethylene moisture barrier is desirable below any slabs to receive relatively impermeable floor coverings. This moisture barrier must be continuous and would be placed shortly before concrete placement. Any moisture/vapor barrier used should be installed per recommendations of ASTM E-1643.

I) Sewer lines beneath the building should have a sufficient slope (minimum 1-1/2 percent). All utility lines should be provided with flexible joints or oversized sleeves where they enter the building to prevent breakage caused by differential movement. Utility lines within the building should, as much as possible, be overhead rather than below the slab. All utility lines throughout the site should be carefully leak tested.

J) The floor slabs can be designed using a modulus of subgrade reaction value of 150 pounds per cubic inch.

The proceeding slab-on-grade precautions with 6 feet of select fill would generally limit potential movements to 1 inch with up to approximately 3 inches of heave possible in

isolated areas. Damages associated with these types of movements could be significant. If the floor slab subsoils are not wetted, future movements would be minimized.

It should be noted that these floor slab comments and recommendations would also apply to the exterior slabs, and pedestrian walkway around building, particularly at critical areas such as attached sidewalks and entryways where doors could be inhibited.

## PERIMETER DRAINAGE SYSTEM

Although present groundwater conditions are favorable for the anticipated floor slab elevation, it is recommended that precautionary subsurface drainage systems connected to sumps or other suitable outlets be provided. The systems consist of peripheral drainage along foundation walls and basement walls.

Peripheral drainage should consist of at least 2 foot width of free drainage granular material and/or drainage board on the back side of the walls and a pipe drain surrounded by granular material at least 24 inches below the slab level and at least 18 inches below the exterior grade. The pipe should be sloped a minimum of 1 percent to the outlet. Peripheral drainage system design should be coordinated with foundation wall backfill material selection.

## LATERAL EARTH PRESSURES

Foundation Walls: Foundation walls will be comparatively rigid and should, in our opinion, be designed for 'at rest' lateral soil pressures. If on-site clay soils are to be used as backfill, the lateral earth pressure design value would be estimated by an equivalent fluid density of 75 pcf. An imported granular, non-swelling soil, such as imported sands with less than 15% of fines, could be used as backfill. The granular soils, if that alternative is selected, must be present within an area defined by a line extending upward from the base of the wall at an angle of 30 degrees from the wall. The lateral earth pressure may then be estimated by using an equivalent fluid density of 55 pcf. The cost of imported granular materials should be considered if an equivalent fluid density of 55 pcf is to be used.

Claystone bedrock(including weathered claystone material) should not be used as backfill. The upper 1 foot of backfill should be fairly impermeable to prevent surface water from entering the backfill.

Temporary Excavation Bracing: Temporary bracing is not necessary for excavation in the on-site silty clay with sand strata if a 1 (horizontal) to 1 (vertical) slope is maintained. For excavation in the on-site silty, clayey sand strata without temporary bracing or shoring, a 1.5 (horizontal) to 1 (vertical) slope should be maintained. If bracing or shoring is necessary at some critical area or desirable for personnel safety, we recommend that an "active" earth pressure of 40 x Z-150 psf be used, where Z=depth of excavation (for example, if a 12 foot excavation is planned, the temporary bracing should be designed for a lateral earth pressure of 40 x 12 - 150 = 330 psf per linear foot).

Retaining Walls: The data presented in the section on basement walls is also generally applicable to site retaining walls with the following modifications:

1) The minimum width of excavation recommended behind the retaining wall, in order to reduce earth pressures and lateral soil expansion pressures, can be estimated as follows: width of backfill =H/1.7 where H is the height of the retaining wall.

2) The lateral earth pressure may then be computed by using an equivalent fluid density of 40 pcf with imported granular backfill such as imported sands with less than 15% of fines or 55 pcf with on-site silty clay soils. Claystone material should not be used as backfill.

It should be noted that the lateral earth pressures provided above do not include any surcharge loadings on the top of retaining wall. Additional earth pressures will be generated depending on the type and location of the surcharge loadings.

3) Drainage should be provided to prevent water build-up behind site retaining walls. Weep holes would be a suitable drainage provision.

Resistance: An ultimate coefficient of sliding friction of 0.40 and an ultimate passive earth pressure, based on equivalent fluid unit weight of 225 pcf may be used to resist sliding. In all case, a factor of safety of 2 is suggested to obtain allowable values.

## EARTH WORK

All topsoil and organic materials should be removed from within the proposed building and pavement areas. Topsoil depths may vary throughout the site but are anticipated to be approximately 4 to 6 inches.

We recommend that cut and fill slopes generally be no steeper than 2 (horizontal) to 1 (vertical). Steeper slopes may be suitable, but will need to be individually considered.

Select fill refers to the fill material to be placed beneath the floor slabs, pavement sections and around foundation walls. The select fill should consist of either inherently non-swelling material, such as sands, or at increased risk, materials which can be placed and maintained in such manner that its swell potential is minimized. Any on-site or imported material should be approved by a geotechnical engineer prior to use as select fill. The on-site silty clay with sand, exclusive of topsoil and organic materials, is anticipated to potentially be the latter type. We recommend further laboratory testing be performed prior to reuse of the on-site silty clay. The on-site claystone bedrock including weathered claystone materials should not be used as select fill. The quantity of the on-site soils that are available to be used as select fill is not known at the time of this report. Import of select fill may be required.

Select fill should be compacted to at least 95 percent of the maximum Standard Proctor density (per ASTM D-698) at a moisture content appropriate for the particular material. We would expect that clay soils would require a moisture content of optimum to 3 percent above optimum in order to minimize swell potentials. The specific moisture content will be determined by the geotechnical engineer at the start of construction and re-verified throughout the process. The specific minimum moisture content for each clay material would be that at which a maximum swell of 1 percent occurred under a 150 psf loading. The swell tests would be run as each Proctor test was performed. The necessary moisture content of any imported material would be determined at the time of approval. The moisture

content of essentially granular material such as sand would not be critical and could be placed within ±2 percent of the optimum moisture content.

**Please note that the on-site silty clay would exhibit higher swell potentials if allowed to become drier. This must not be allowed to occur during the construction period below any foundations, floor slabs, and/or pavement subgrade. Otherwise, the potential heaves could increase significantly.**

Fill in landscaped areas may be placed at a minimum of 88 percent of the maximum Standard Proctor density with no moisture control.

## DESIGN AND CONSTRUCTION DETAILS

Piers:

1) Piers should be reinforced longitudinally with one No. 5 steel (Grade 60) rod for each 16 inches of pier perimeter (minimum two rods), to help prevent breakage of the piers due to uplift on their sides by swelling materials. The bedrock penetration portion of the pier holes should be roughened artificially. The upper portion of the pier holes should be kept smooth to reduce the adhesion between the swelling materials and the piers. Enlargement of the tops of the piers (mushrooming) must be avoided.

2) A 6 inch minimum "air space"(void form) should be provided beneath the portions of the grade beams that span between piers.

3) Due to presence of groundwater and granular soils in the exploratory borings, use of temporary casing and slurry drilling techniques may be required to install piers. However, groundwater infiltration greater than 3 inches could occur in pier holes whether the upper portion is cased or not. Pumping to remove water or underwater concrete placement procedures would then be required. Concrete should be placed immediately after drilling and inspection in order to minimize water infiltration problems.

4) Concrete should be placed in drilled piers the same day they drilled. The presence of water may require that concrete be placed immediately after each drilled pier hole is completed. Failure to place concrete the day of drilling will normally result in a requirement for additional penetration. Concrete used in the drilled piers should be a fluid mix with a sufficient slump so it will fill the void between reinforcing steel and the drilled pier hole. Typically a slump on the order of 5 to 7 inches is considered adequate.

5) Backfill around the building should be a non-swelling material, moisture conditioned and compacted to at least 95 percent of the maximum Standard Proctor density (per ASTM D-698) at a moisture content sufficient to minimize swell potential. The exterior grades should be well sloped away from the structure. A minimum slope of 6 inches in the first 10 feet is recommended. However, a slope of 3.5 inches in 10 feet could be used in paved areas.

## CONCRETE

The sulfate concentration of the soil sample tested was 0.028 percent. This concentration represents a negligible degree of sulfate attack on concrete. However, as a precautionary measure, we recommend Type II cement be used in all concrete exposed to earth.

## PAVEMENT RECOMMENDATIONS

The pavement subgrade material is expected to generally be silty clay with some sand and typically classify as A-6 material according to the AASHTO Classification System. A Hveem "R" value of 13 was assumed in the pavement calculations.

**If the City of Aurora Roadway Design and Construction Specifications are to be met in the proposed parking areas and private roadways, additional investigation will be required.**

Based on the subsurface soils encountered and the assumed traffic loads, the following minimum pavement sections are recommended:

A) **AUTO AND LIGHT TRUCK PARKING AREAS AREAS (EDLA of 5)**

1) 5.0 inches of full-depth asphalt; **OR**
2) 3.5 inches of asphalt overlying and 6 inches of granular base course; **OR**
3) 5.0 inches of concrete(not recommended)

B) **PRIVATE AUTO AND LIGHT TRUCK DRIVEWAYS (EDLA of 30)**

1) 7.0 inches of full-depth asphalt; **OR**
2) 5.0 inches of asphalt overlying 7 inches of granular base course; **OR**
3) 6.0 inches of concrete(not recommended)

C) **PRIVATE DELIVERY TRUCK TRAFFIC AREAS (EDLA of 100)**

1) 8.5 inches of full-depth asphalt; **OR**
2) 6.0 inches of asphalt overlying 8 inches of granular base course; **OR**
3) 7.0 inches of concrete

We recommend that the 7.0 inches concrete pavement be used for loading/unloading areas, and areas where truck turning movements are concentrated, including trash dumpster areas. Concrete pavements should have a rough finish to help mask cracking.

The full-depth asphalt pavement sections are preferred over the asphalt and base course composite pavement sections. The granular base course could detrimentally spread water throughout large areas of pavement subgrade.

All topsoil and organic materials should be removed entirely from proposed pavement areas.

Prior to placement of pavement sections or acceptance of new fill, the on-site soils should be scarified at least 12 inches, moisture conditioned, and compacted to at least 95 percent of the maximum Standard Proctor density (per ASTM D-698) at a moisture content sufficient to minimize the swell potential. The necessary moisture content of any material would be determined at the time of approval.

Prior to placement of pavement sections, the subgrade should then be proof rolled with a heavy pneumatic-tired vehicle, such as a loaded dump truck of approximately 20,000 pounds. Any soils which are noted to be pumping or deforming excessively under the moving wheel loads should be removed and replaced with a properly compacted and approved material. It is recommended that this operation be observed by a geotechnical engineer.

The asphalt (hot plant mix) should also meet Colorado Highway Department specifications. We suggest a specific job mix formula meeting Grading C (3/4 inch maximum size) aggregate be used.

The asphalt mix should have a minimum Marshall stability of 1,800 pounds and a flow of between 8 and 18 (ASTM D-1559). The asphalt should be compacted to at least 95 percent of the density obtained from laboratory specimens made in accordance with the Marshall method (per ASTM D-1559).

The granular base course should meet Colorado Highway Department specifications. The use of Class 6 (3/4 inch maximum size) aggregate is suggested. The base course should be compacted to at least 95 percent of the maximum Modified Proctor density (per ASTM D-1557).

Concrete used for pavements should meet Colorado Highway Department specifications. We suggest the use of Class P concrete.

Adequate surface drainage provisions should be made so as to prevent water flow into the subgrade soils beneath the pavements. The life of any pavement structure is greatly diminished by improper drainage.

Subgrade failure due to excessive wetting of subgrade soils is a major contributor to premature pavement distress and/or damage. Chemical i.e. lime/fly ash treated subgrade soils could minimize the potential of subgrade failure if wetting of the pavement subgrade

occurs. Additional information can be provided if chemical treatment of subgrade soils is considered.

## MISCELLANEOUS

In any geotechnical investigation it is necessary to assume that subsurface conditions do not change greatly from those indicated by our exploratory borings. However, our experience has shown that anomalies do sometimes become apparent during construction. For that reason, we recommend that a representative from our firm observe the construction operations discussed in this report.

Respectfully submitted,

CTC-Geotek, Inc.

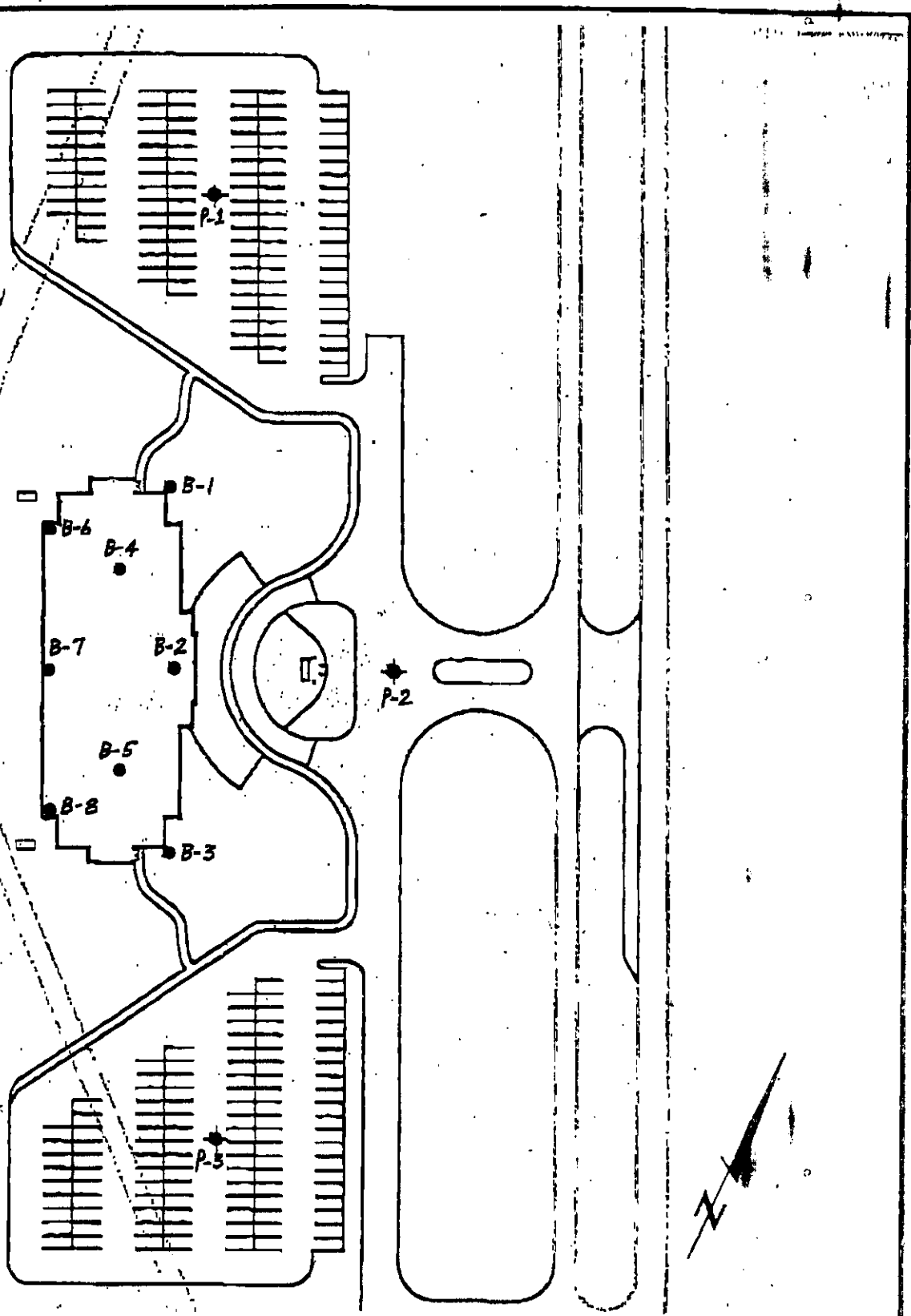
By: _____
Jie Yu, P.E.
Project Engineer

Reviewed by: _____
Robert Scavuzzo, P. E.
Senior Engineer

COLORADO REGISTERED ROBERT SCAVUZZO 27065 PROFESSIONAL ENGINEER

JY:RS

3 copies sent




APPROXIMATE BORING LOCATION PLAN

CTC-GEOTEK
ENGINEERING TESTING INSPECTION
155 S. Navajo • Denver, CO 80223 • 303-698-1050

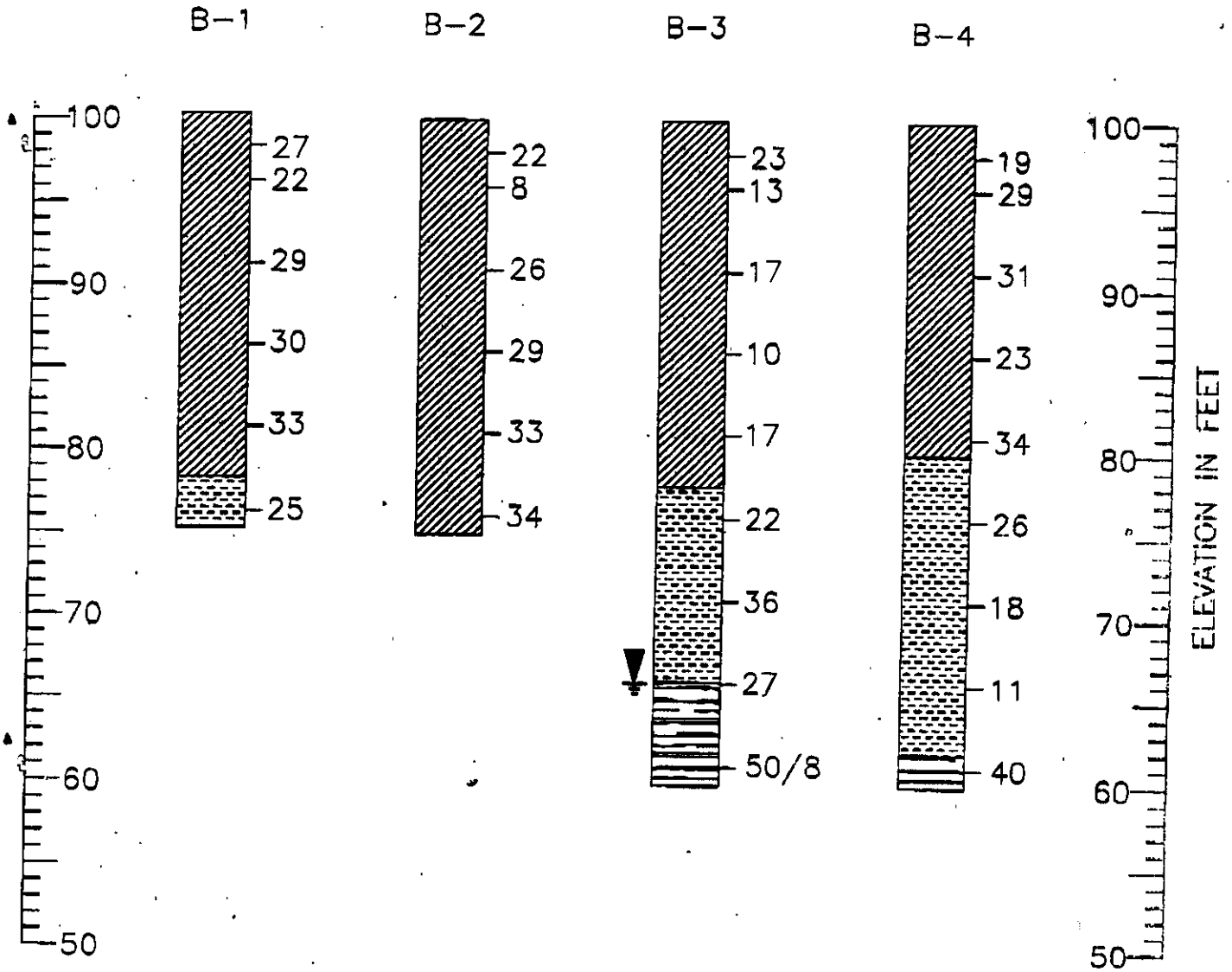
Wing Headquarter/Administration Facility
Buckley Air National Guard Base
Aurora, Colorado

DRAWN BY: JY
CHECKED BY: RS
DATE: 7/12/02

SCALE: Vertical NTS
Horizontal NTS

JOB NO. 222056

PLATE 1




LOGS OF EXPLORATORY BORINGS

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ENGINEERING TESTING INSPECTION
155 S. Navajo • Denver, CO 80223 • 303-698-1050

Wing Headquarter/Administation Facility
Buckley Air National Guard Base
Aurora, Colorado

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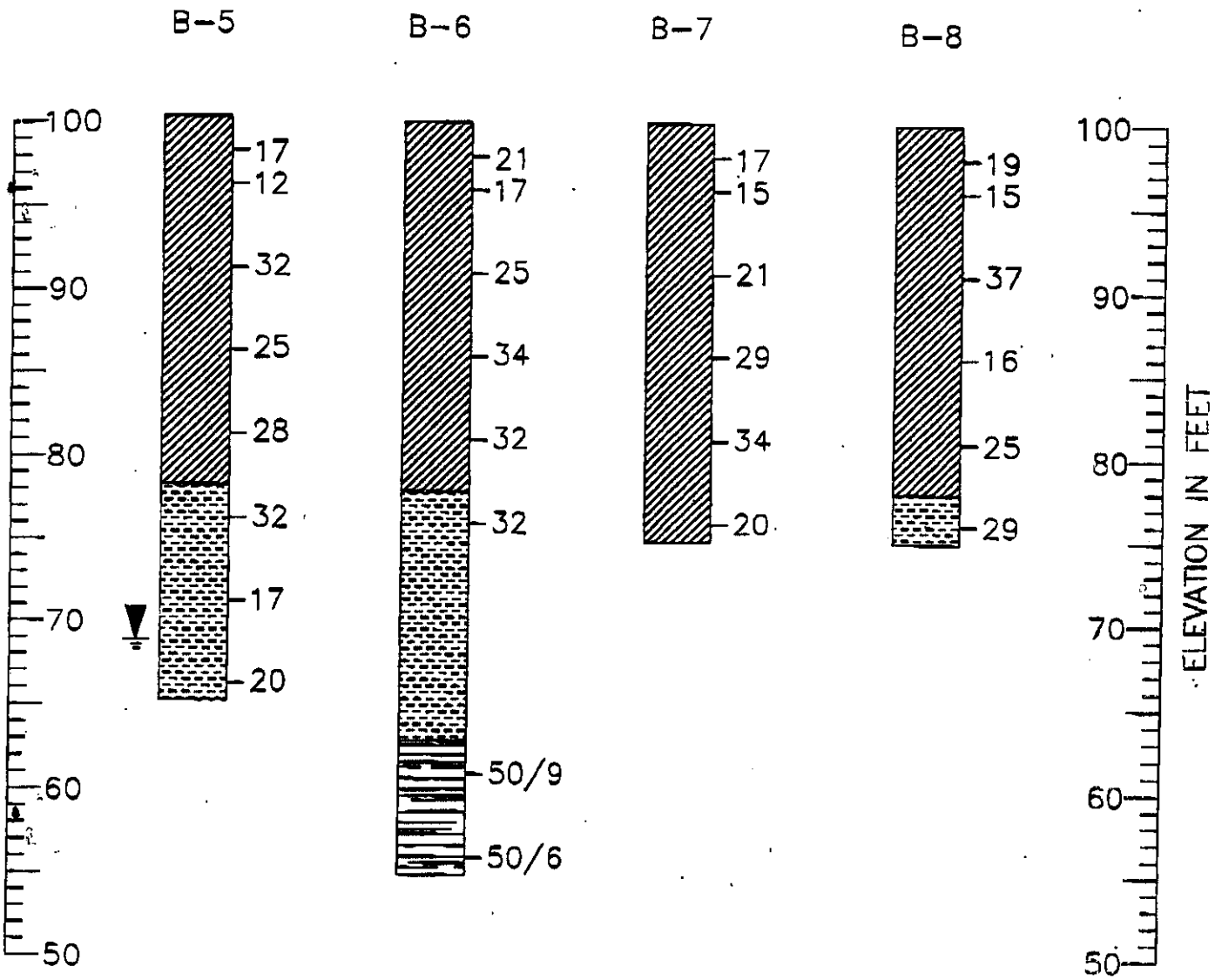
CHECKED BY: RS
DATE: 7/11/02

SCALE: Vertical NOT TO SCALE
Horizontal NOT TO SCALE

JOB NO. 222056

PLATE 2




LOGS OF EXPLORATORY BORINGS

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Aurora, Colorado

DRAWN BY: JY
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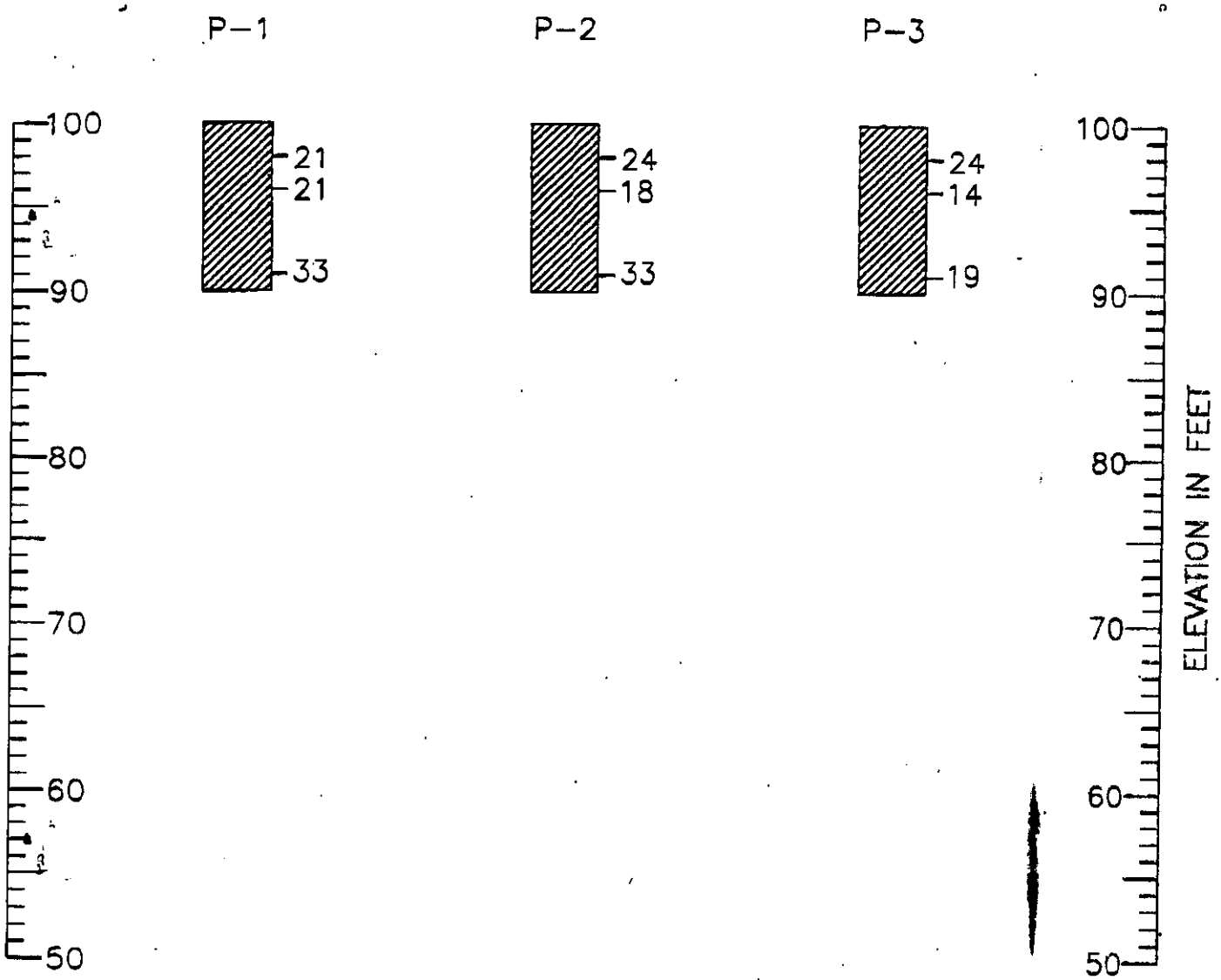
DATE: 7/11/02

SCALE Vertical NOT TO SCALE
Horizontal NOT TO SCALE

JOB NO. 222056

PLATE 3




LOGS OF EXPLORATORY BORINGS

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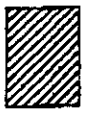
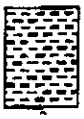
Horizontal NOT TO SCALE

JOB NO. 22056

PLATE 4



Silty clay with some sand, brown to light brown, slightly moist to moist, firm to stiff.



Silty, clayey sand, light brown to brown, moist to wet, medium dense to dense.

Claystone bedrock, grey to yellowish grey to brown, moist to very moist, stiff to hard.

Groundwater level in the exploratory boring.

NOTES:

(1) Borings were drilled on June 14th, 17th, 2002 with 4-inch solid stem power augers.
(2) Stratification lines represent approximate boundaries, actual transition may be gradual.
(3) The logs only show conditions at the time and location indicated.
(4) Groundwater was encountered in the exploratory borings at the depth indicated.
(5) 27 indicates 27 blows of a 140-pound hammer falling 30 inches to drive the sampler 12 inches. 50/8 indicates the number of blows for 8 inches of penetration.

LEGEND AND NOTES

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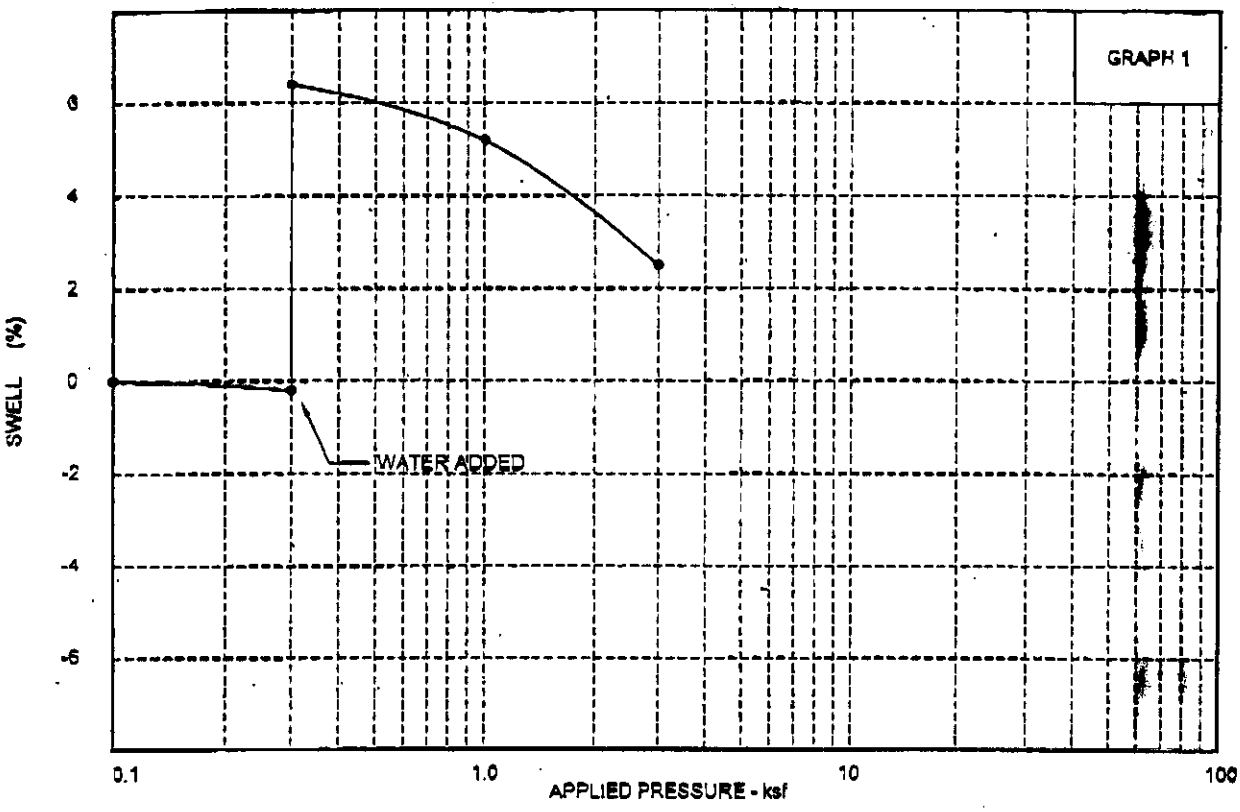
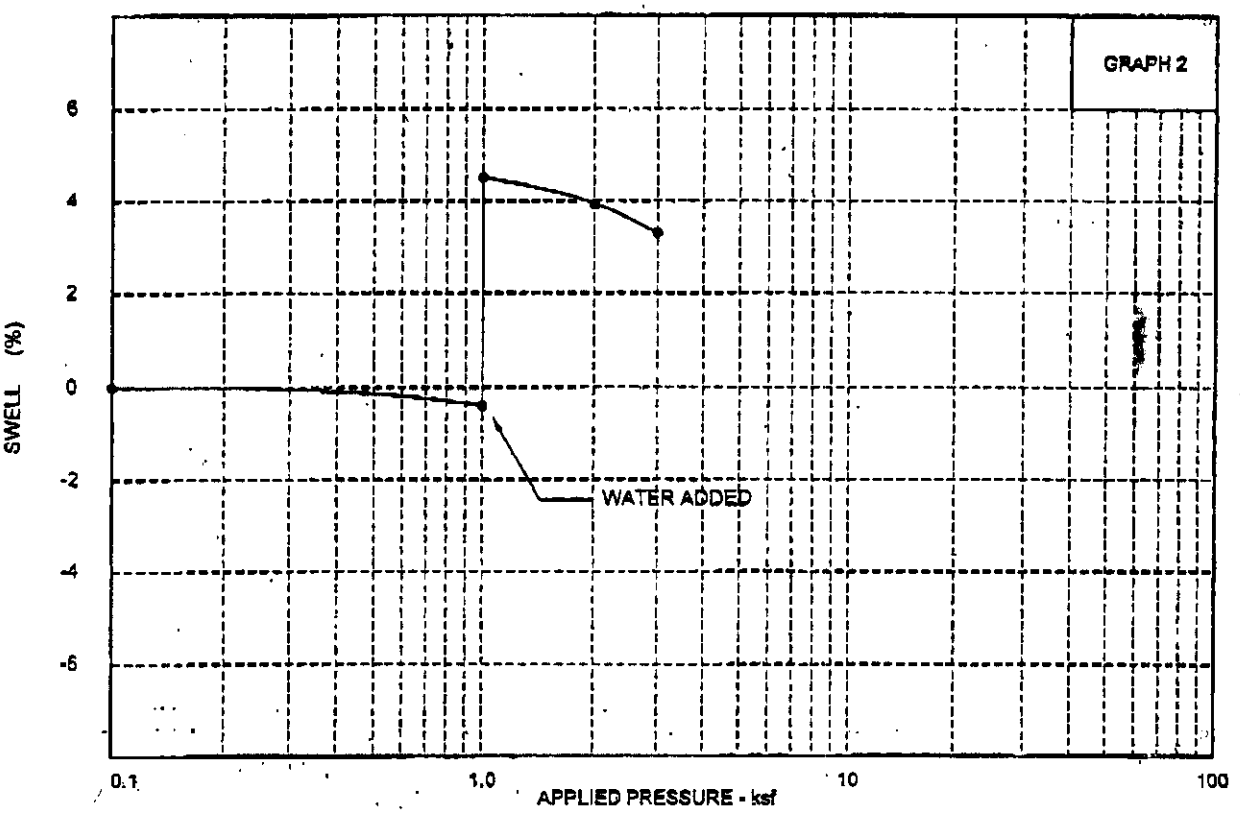
SCALE: Vertical NOT TO SCALE
Horizontal NOT TO SCALE

JOB NO. 222056

PLATE 5




| GRAPH NO. | BORING NO. | SAMPLE NO. | DEPTH IN FEET | DRY DENSITY (PCF) | MOISTURE (%) | SOIL DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | B1 | C1 | 2 | 110.9 | 8.5 | Silty Clay, and sand |
| 2 | B1 | C4 | 14 | 114.9 | 13.8 | Silty Clay, some sand |

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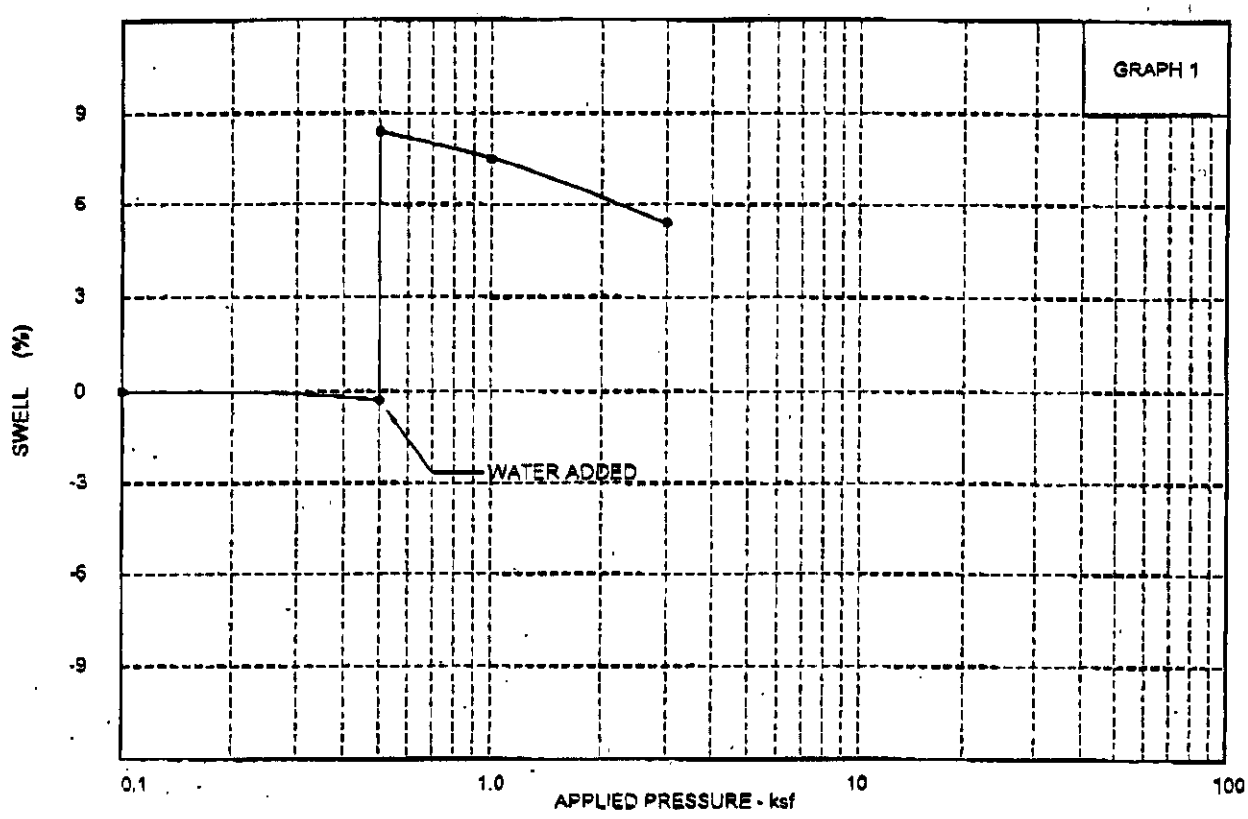
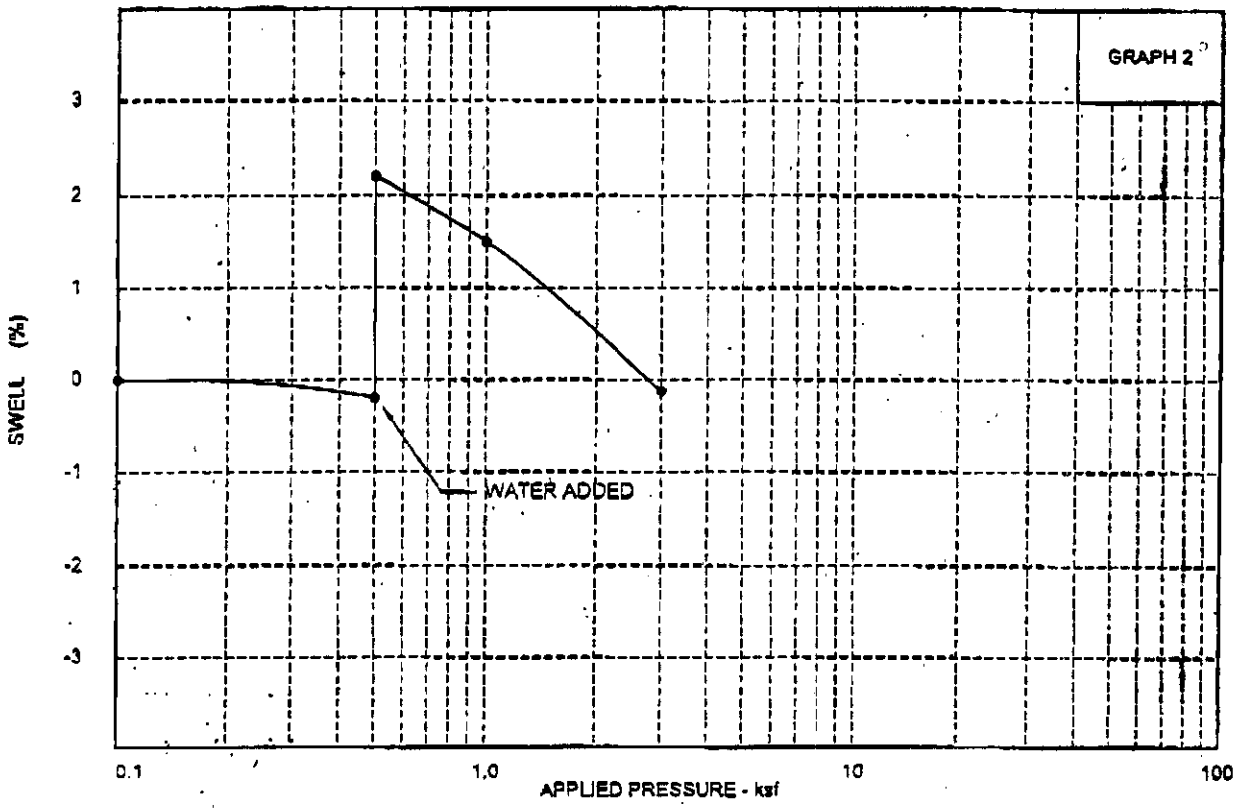
SWELL - CONSOLIDATION TEST

DRAWN BY: JLW JOB NO.: 222[illegible]

DATE: 7-9-2002 PLATE: 6




| GRAPH NO. | BORING NO. | SAMPLE NO. | DEPTH IN FEET | DRY DENSITY (PCF) | MOISTURE (%) | SOIL DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | B2 | C3 | 9 | 120.2 | 12.1 | Silty Clay, some sand |
| 2 | B3 | C3 | 9 | 116.9 | 11.9 | Silty Clay, some sand |

CTC-GEOTEK

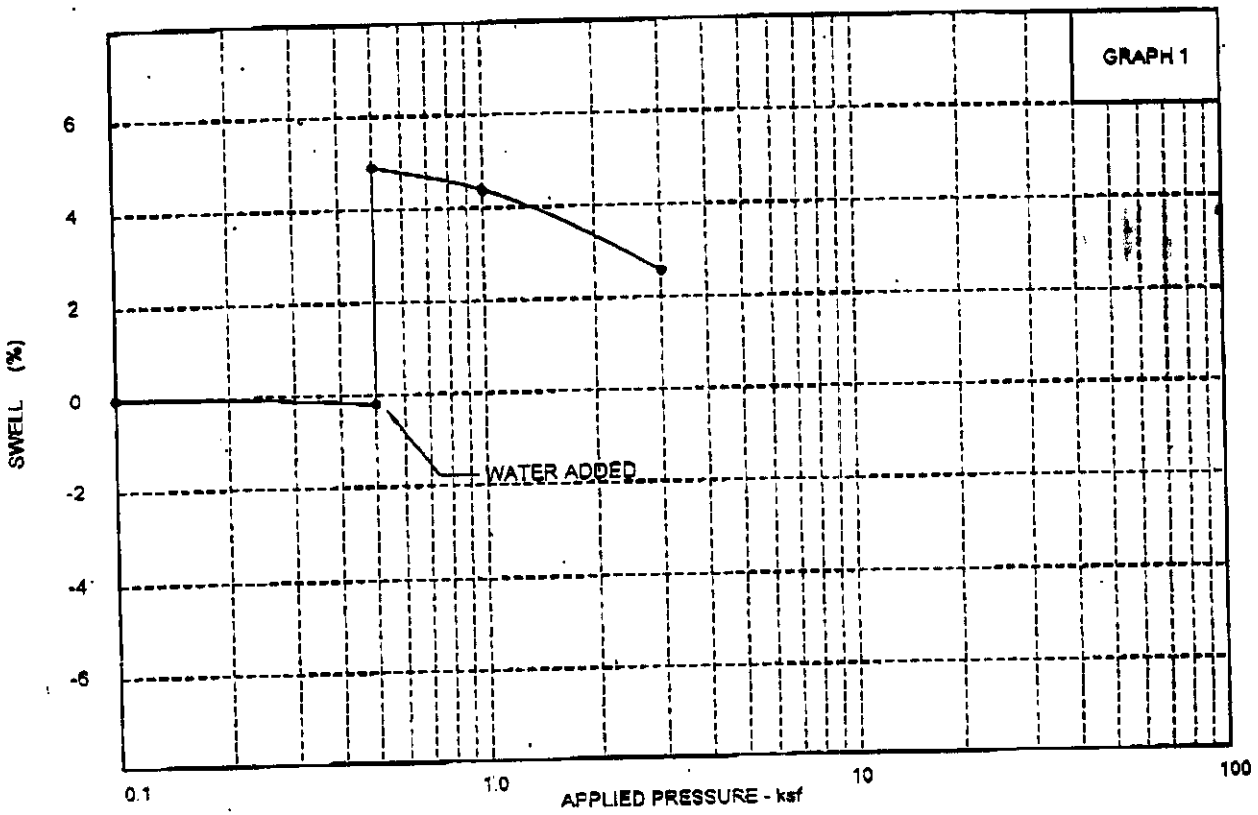
SWELL - CONSOLIDATION TEST

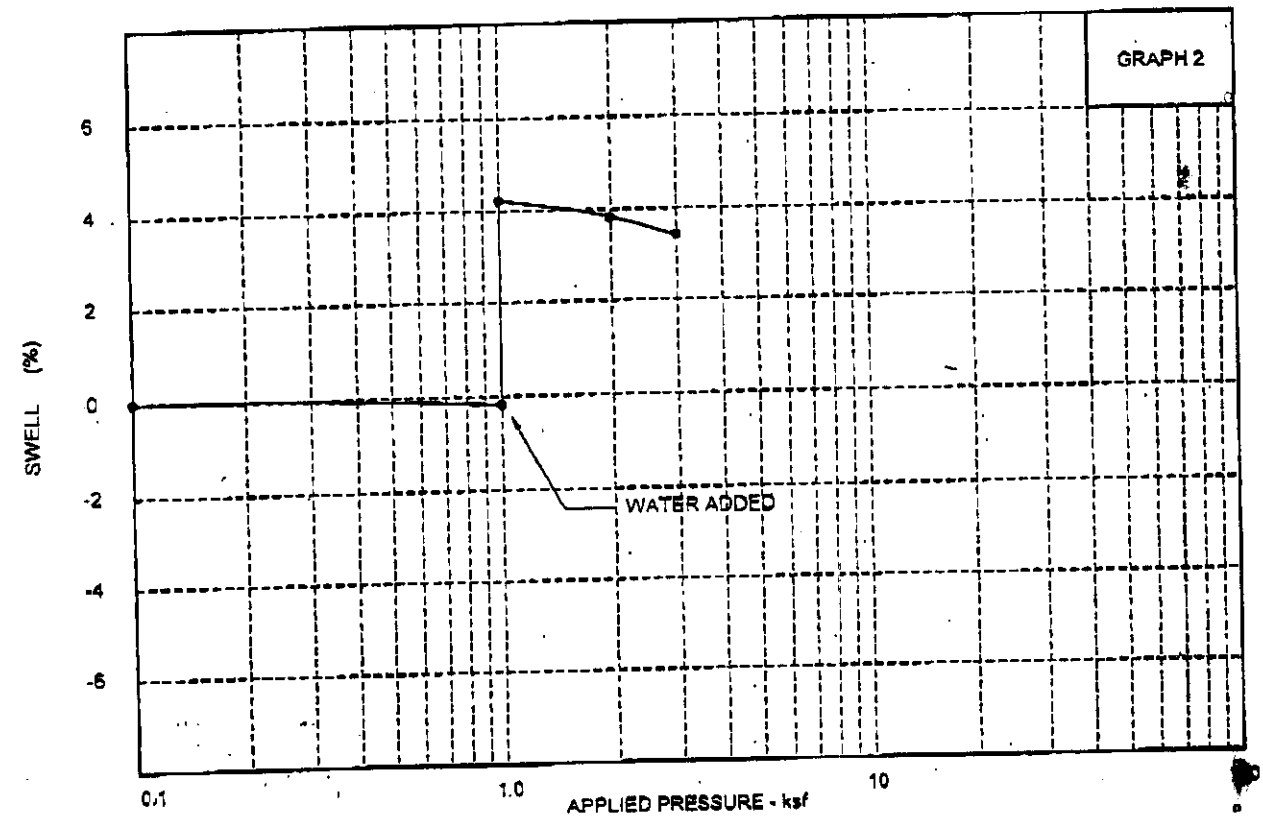
DRAWN BY: JLW

DATE: 7-8-2002

JOB NO.: 222056

PLATE: 7




| GRAPH NO. | BORING NO. | SAMPLE NO. | DEPTH IN FEET | DRY DENSITY (PCF) | MOISTURE (%) | SOIL DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | B4 | C3 | 9 | 120.2 | 10.5 | Silty Clay, some sand |
| 2 | B5 | C4 | 14 | 120.8 | 11.6 | Silty Clay, little sand |

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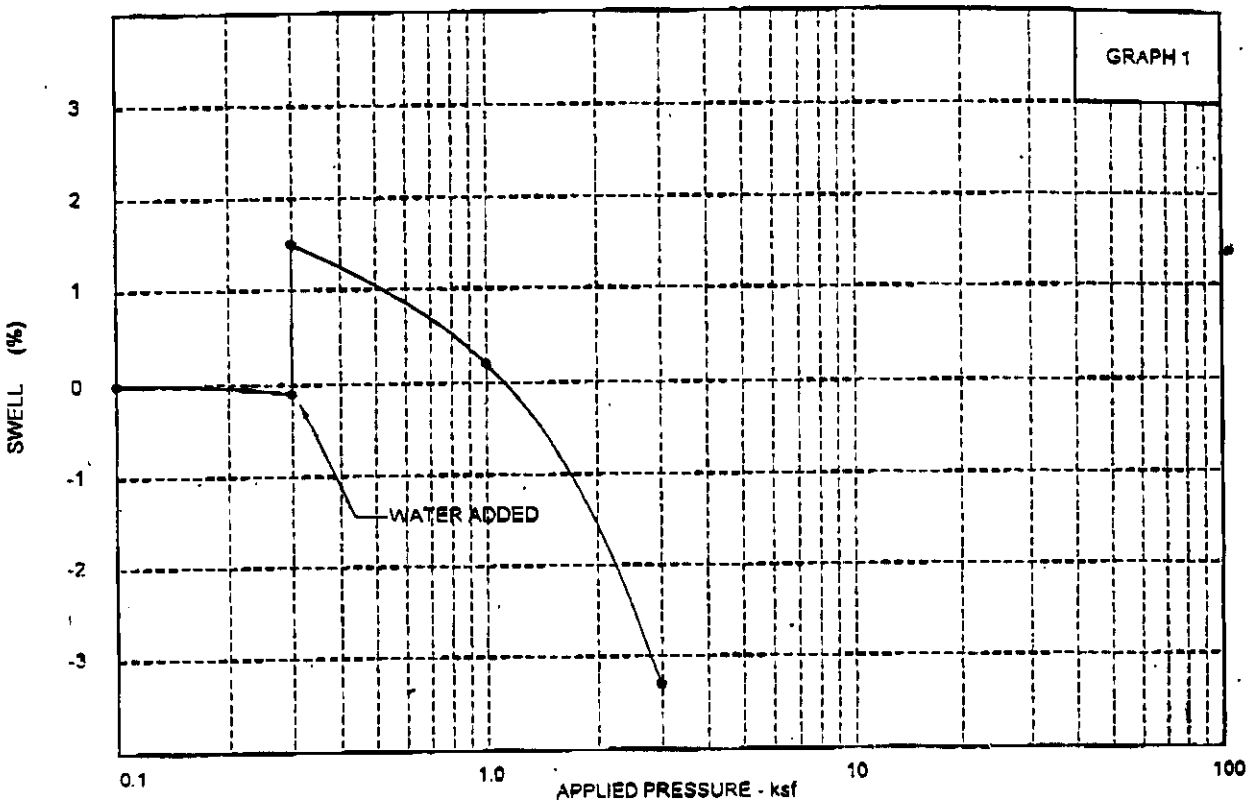
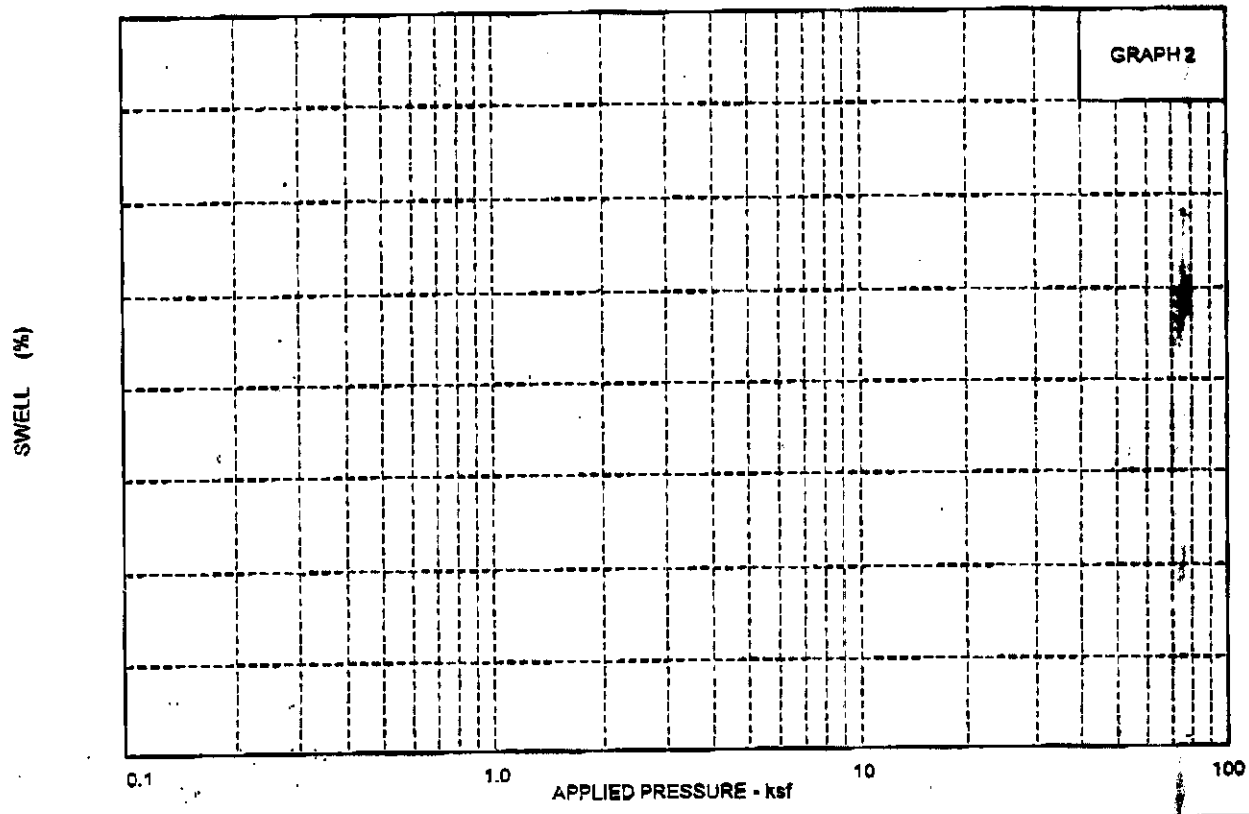
SWELL - CONSOLIDATION TEST

DRAWN BY: JLW JOB NO.: 222056

DATE: 7-9-2002 PLATE: 8




| GRAPH NO. | BORING NO. | SAMPLE NO. | DEPTH IN FEET | DRY DENSITY (PCF) | MOISTURE (%) | SOIL DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | B7 | C1 | 2 | 108.8 | 5.7 | Silty Clay, some sand |
| 2 | | | | | | |

GTC-GEOTEK

SWELL - CONSOLIDATION TEST

DRAWN BY: JLW JOB NO: 222056

DATE: 7-9-2002 PLATE: 9

CTC-GEOTEK
ENGINEERING TESTING INSPECTION

# SUMMARY OF LABORATORY TEST RESULTS

Project No. 222056

| BORING NO. | SAMPLE NO. | DEPTH IN FEET | SAMPLE TYPE (NOTE 1) | DRY DENSITY (PCF) | MOISTURE (%) | ATTERBERG LIMITS LL | ATTERBERG LIMITS PI | ATTERBERG LIMITS PL | % FINES | WATER SOLUBLE SULFATES (%) | SHEAR STRENGTH (PSF) (NOTE 2) | ADDITIONAL TEST RESULTS ATTACHED (NOTE 3) | | SOIL DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B1 | C1 | 2 | CA | 110.9 | 8.5 | 40 | 28 | 12 | 64.4 | | | SW | | Silty Clay, and sand A-6(15) CL |
| B1 | C4 | 14 | CA | 114.9 | 13.6 | | | | | | | SW | | Silty Clay, some sand |
| B2 | C3 | 9 | CA | 120.2 | 12.1 | | | | | | | SW | | Silty Clay, some sand |
| B3 | C3 | 9 | CA | 116.9 | 11.9 | | | | | | | SW | | Silty Clay, some sand |
| B4 | C3 | 9 | CA | 120.2 | 10.5 | 45 | 35 | 10 | 65.7 | | | SW | | Silty Clay, some sand A-2-7(13) CL |
| B4 | C9 | 39 | CA | 105.9 | 21.8 | | | | | .028 | | | | Claystone |
| B5 | C4 | 14 | CA | 120.8 | 11.6 | | | | | | | SW | | Silty Clay, little sand |
| B7 | C1 | 2 | CA | 108.8 | 5.7 | | | | | | | SW | | Silty Clay, some sand |

NOTE 1 - SAMPLE TYPE

AD - Air Dried
AS - Auger Sample
BS - Bag Sample
CA - California Sample
HD - Hand Drive
RM - Remolded Sample
ST - Shelby Tube Sample

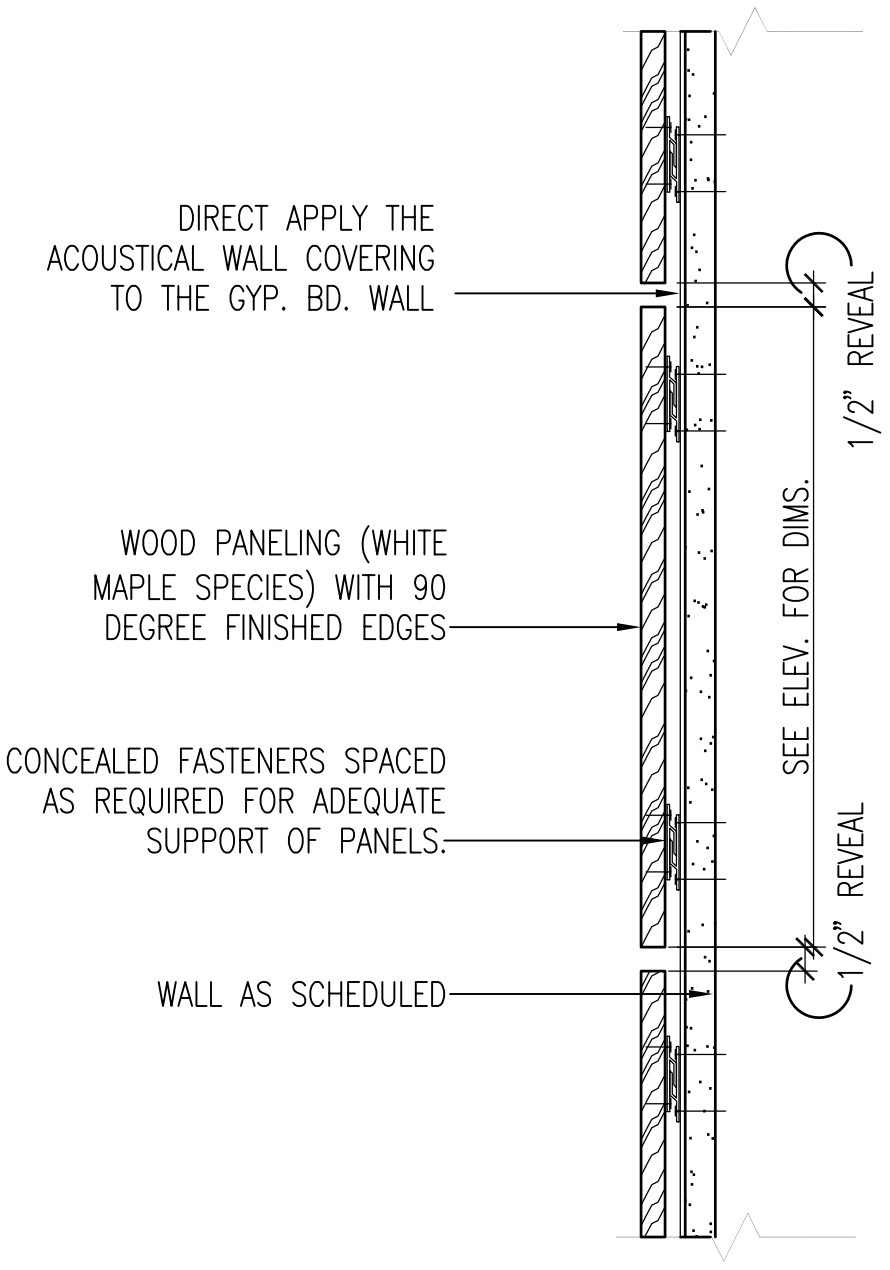
NOTE 2 - SHEAR STRENGTH TESTS

$C_1$ - Unconfined Compression
$C_2$ - Miniature Vane Shear
$C_3$ - Pocket Penetrometer
$C_4$ - Pocket Vane

NOTE 3 - ADDITIONAL TEST RESULTS ATTACHED

CT - Consolidation Test
GA - Gradation Analysis
PT - Proctor
RV - R-Value
SW - Swell-Consolidation Test
TT - Triaxial Test

TABLE 1




A2
A4.23 A4.23

# WALL PANELING DETAIL

SCALE: 3"=1'-0"